WHAT IS CLAIMED IS:

1   1.   In a wireless access network having a Mobile
2   Switching Center (MSC), a Base Station Controller (BSC),
3   a Packet Control Function (PCF), and a Packet Data
4   Service Node (PDSN) providing a packet-data session with
5   a packet-data network, a method of optimizing the use of
6   packet-resources by eliminating a hanging packet-data
7   connection when a Mobile Station (MS) performs a power-
8   down while the packet-data session is in a dormant state,
9   said method comprising the steps of:
10   sending a message from the BSC to the MSC indicating
11   that the MS has powered down;
12   determining in the MSC that the packet-data session
13   is dormant;
14   sending an instruction from the MSC to the BSC to
15   release network resources associated with the packet-data
16   session;
17   sending an instruction from the BSC to the PCF to
18   tear down the associated resources; and
19   releasing the packet-data connection by the PDSN in
20   response to the tearing down of the resources by the PCF.

1   2.   The method of optimizing the use of packet-

2   resources of claim 1 wherein the step of determining in

3   the MSC whether the packet-data session is dormant

4   includes determining whether the MSC has previously

5   received from the BSC, an Assignment Failure indicating

6   the packet data session is going dormant.

1   3.   The method of optimizing the use of packet-

2   resources of claim 1 wherein the step of sending an

3   instruction from the MSC to the BSC to release network

4   resources includes sending the instruction in a class-0

5   connectionless transaction.

1   4.   In a wireless access network having a Mobile

2   Switching Center (MSC), a Base Station Controller (BSC),

3   a Packet Control Function (PCF), and a Packet Data

4   Service Node (PDSN) providing a packet-data session with

5   a packet-data network, a method of optimizing the use of

6   packet-resources by eliminating a hanging packet-data

7   connection when a Mobile Station (MS) performs a power-

8   down while the packet-data session is in a dormant state,

9   said method comprising the steps of:

10   receiving in the BSC, a power-down registration from

11   the MS;

12   sending from the BSC, an update message to the PCF

13   that includes an indication that the MS has powered down;

14   sending an indication from the PCF to the PDSN

15 indicating that the lifetime of the packet-data

16 connection is zero (0); and

17   releasing the packet-data connection by the PDSN in

18 response to the indication from the PCF.

1   5.   The method of optimizing the use of packet-

2   resources of claim 4 further comprising sending a

3   location updating message from the BSC to the MSC to

4   initiate a release of radio resources, said location

5   updating message being sent simultaneously with the

6   update message sent from the BSC to the PCF.

1   6.   In a wireless access network having a Mobile

2   Switching Center (MSC), a Base Station Controller (BSC),

3   a Packet Control Function (PCF), and a Packet Data

4   Service Node (PDSN) providing a packet-data session with

5   a packet-data network, a method of optimizing the use of

6   packet-resources by eliminating a hanging packet-data

7   connection when an authentication failure is received for

8   a Mobile Station (MS) after the packet-data connection is

9   established between the MS and the PDSN, said method

10 comprising the steps of:

11   sending an indication of the authentication failure

12 from the MSC to the BSC;

13   sending from the BSC, an instruction to the PCF to
14 release its connection with the BSC due to authentication
15 failure;

16   clearing by the PCF, its connection with the BSC,
17 and initiating closure of its connection with the PDSN in
18 response to the instruction from the BSC; and

19   releasing the packet-data connection by the PDSN in
20 response to the closure of the connection from the PCF.

1   7.   In a wireless access network having a Mobile
2 Switching Center (MSC), a Base Station Controller (BSC),
3 a Packet Control Function (PCF), and a Packet Data
4 Service Node (PDSN) providing a packet-data session with
5 a packet-data network, a method of optimizing the use of
6 packet-resources by eliminating a hanging packet-data
7 connection when an authentication failure is received for
8 a Mobile Station (MS) after the MS performs an intra-
9 BSC/intra-PCF/inter-PDSN dormant handoff, said method
10 comprising the steps of:
11   sending an indication of the authentication failure
12 from the MSC to the BSC;
13   sending from the BSC, an update message to the PCF
14 that includes an identity of the MS and an indication
15 that authentication failed for a dormant packet-data
16 session;

17   sending an indication from the PCF to the PDSN

18 indicating that the lifetime of the packet-data

19 connection is zero (0); and

20   releasing the packet-data connection by the PDSN in

21 response to the indication from the PCF.

1   8.   In a wireless access network having a Mobile

2 Switching Center (MSC), a Base Station Controller (BSC),

3 a Packet Control Function (PCF), and a Packet Data

4 Service Node (PDSN) providing a packet-data session with

5 a packet-data network, a method of optimizing the use of

6 packet-resources by eliminating a hanging packet-data

7 connection when an authentication failure is received for

8 a Mobile Station (MS) after the MS performs an inter-PDSN

9 dormant handoff, said method comprising the steps of:

10   reactivating the packet-data session;

11   sending an indication of the authentication failure

12 from the MSC to the BSC;

13   sending from the BSC, an instruction to the PCF to

14 release its connection with the BSC due to authentication

15 failure;

16   clearing by the PCF, its connection with the BSC,

17 and initiating closure of its connection with the PDSN in

18 response to the instruction from the BSC; and

19   releasing the packet-data connection by the PDSN in

20 response to the closure of the connection from the PCF.

1   9.   The method of optimizing the use of packet-
2   resources of claim 8 wherein the step of sending an
3   indication of the authentication failure from the MSC to
4   the BSC includes sending a Clear command to the BSC using
5   a Signaling Connection Control Part (SCCP) connection,
6   the Clear command having a cause value of "authentication
7   failure".

1   10. A Mobile Switching Center (MSC) in a wireless
2   access network having a Base Station Controller (BSC), a
3   Packet Control Function (PCF), and a Packet Data Service
4   Node (PDSN) providing a Mobile Station (MS) with a
5   packet-data session with a packet-data network, said MSC
6   comprising:
7   a first signaling means for receiving a message from
8   the BSC indicating that the MS has powered down;
9   means for determining in the MSC that the packet-
10   data session is dormant; and
11   a second signaling means for sending an instruction
12   to the BSC to release network resources associated with
13   the packet-data session.

1   11. The MSC of claim 10 wherein the means for
2   determining that the packet-data session is dormant
3   includes means for determining whether the MSC has

4   previously received from the BSC, a Location Update
5   Request associated with the packet-data session.

1   12. The MSC of claim 10 wherein the second
2   signaling means sends the instruction to the BSC in a
3   class-0 connectionless transaction.

1   13. A Base Station Controller (BSC) in a wireless
2   access network having a Mobile Switching Center (MSC), a
3   Packet Control Function (PCF), and a Packet Data Service
4   Node (PDSN) providing a Mobile Station (MS) with a
5   packet-data session with a packet-data network, said BSC
6   comprising:
7   a first signaling means for receiving a power-down
8   registration from the MS when the packet-data session is
9   dormant; and
10   a second signaling means for sending from the BSC,
11   an update message to the PCF that instructs the PCF to
12   release resources associated with the packet-data session
13   due to the MS powering down.

1   14. The BSC of claim 13 further comprising a third
2   signaling means for sending a location updating message
3   from the BSC to the MSC to initiate a release of radio
4   resources, said location updating message being sent

5   simultaneously with the update message sent from the BSC

6   to the PCF.

1   15. A Base Station Controller (BSC) in a wireless

2   access network having a Mobile Switching Center (MSC), a

3   Packet Control Function (PCF), and a Packet Data Service

4   Node (PDSN) providing a Mobile Station (MS) with a

5   packet-data session with a packet-data network, said BSC

6   comprising:

7   a first signaling means for receiving a message from

8   the MSC indicating that authentication failed for the MS

9   when the packet-data session is dormant; and

10   a second signaling means for sending from the BSC,

11   an instruction to the PCF to release its connection with

12   the BSC due to authentication failure.

1   16. A system for optimizing the use of packet-

2   resources in a wireless access network by eliminating a

3   hanging packet-data connection at a Packet Data Service

4   Node (PDSN) when a Mobile Station (MS) performs a power-

5   down while a packet-data session is in a dormant state,

6   said system comprising:

7   a Mobile Switching Center (MSC), said MSC

8   comprising:

9   a first signaling means for receiving a message

10   from the BSC indicating that the MS has powered down; and

11   a second signaling means for sending an
12 instruction to the BSC to release network resources
13 associated with the packet-data session;

14   a Base Station Controller (BSC) that receives the
15 instruction from the MSC and sends a release instruction
16 to a Packet Control Function (PCF) to release packet-data
17 resources;

18   a Packet Control Function (PCF) that releases its
19 connection to the BSC and initiates closure of its
20 connection to the PDSN in response to the release
21 instruction received from the BSC; and

22   a Packet Data Service Node (PDSN) that releases the
23 packet-data connection in response to the PCF initiating
24 closure of its connection to the PDSN.

1   17. A system for optimizing the use of packet-
2 resources in a wireless access network by eliminating a
3 hanging packet-data connection at a Packet Data Service
4 Node (PDSN) when a Mobile Station (MS) performs a power-
5 down while a packet-data session is in a dormant state,
6 said system comprising:

7   a Mobile Switching Center (MSC) that control radio
8 resources in the wireless access network;

9   a Base Station Controller (BSC), said BSC
10 comprising:

11   a first signaling means for receiving a power-

12   down registration from the MS when the packet-data

13   session is dormant; and

14   a second signaling means for sending from the

15   BSC, an update message to a Packet Control Function (PCF)

16   that instructs the PCF to release resources associated

17   with the packet-data session due to the MS powering down;

18   a PCF that releases its connection to the BSC and

19   initiates closure of its connection to the PDSN in

20   response to the release instruction received from the

21   BSC; and

22   a PDSN that releases the packet-data connection in

23   response to the PCF initiating closure of its connection

24   to the PDSN.

1   18. The system for optimizing the use of packet-

2   resources of claim 17 wherein the BSC also includes a

3   third signaling means for sending a location updating

4   message from the BSC to the MSC to initiate a release of

5   radio resources, said location updating message being

6   sent simultaneously with the update message sent from

7   the BSC to the PCF.

1   19. A system for optimizing the use of packet-

2   resources in a wireless access network by eliminating a

3   hanging packet-data connection at a Packet Data Service

4   Node (PDSN) when an authentication failure is received

5   for a Mobile Station (MS) that is involved in a dormant

6   packet-data session, said system comprising:

7   a Mobile Switching Center (MSC) comprising:

8   an authentication signaling means for receiving

9   from an Authentication Center, an indication of the

10   authentication failure for the MS; and

11   a Base Station Controller (BSC) signaling means

12   for sending a message to a BSC indicating the

13   authentication failure;

14   a Base Station Controller (BSC), said BSC

15   comprising:

16   an MSC signaling means for receiving a message

17   from the MSC indicating the authentication failure for

18   the MS; and

19   a Packet Control Function (PCF) signaling means

20   for sending from the BSC, an instruction to a PCF to

21   release its connection with the BSC due to authentication

22   failure;

23   a PCF that releases its connection to the BSC and

24   initiates closure of its connection to the PDSN in

25   response to the release instruction received from the

26   BSC; and

27   a PDSN that releases the packet-data connection in

28   response to the PCF initiating closure of its connection

29   to the PDSN.